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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/642,611	08/19/2003	Toshitaka Aoyagi	402761	2829

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EXAMINER	
VAN ROY, TOD THOMAS	

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 10/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/642,611	AOYAGI ET AL.	
	Examiner	Art Unit	
	Tod T. Van Roy	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *25 August 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 6-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *08/05/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The examiner acknowledges the inclusion of the correct drawing sheets in the applicant's response, as well as the amending of claims 1-3, and 6-9, and the cancellation of claims 4-5.

Response to Arguments

Applicant's arguments with respect to claims 1-3, and 6-9 have been considered but are moot in view of the new ground(s) of rejection. The new grounds of rejection include the limitation of the diffraction gratings having different periods, as stated in claim 1. The remainder of the claims are directed particularly to the diffraction gratings found in the DFB structure, and all of the cited prior art speaks towards DFB structures and the details of their diffraction gratings, making them all pertinent to the claims. Please see the rejections of the claims below for further detail.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, and 8 are rejected under 35 U.S.C: 103(a) as being unpatentable over Abe et al. (US 5020072) in view of Lo (US 5617436), and further in view of Sato (US 6175581).

With respect to claim 1, Abe teaches a refractive index coupling distributed feedback (DFB) semiconductor laser comprising opposed first and second end surfaces through which light generated within the semiconductor laser may be emitted (fig.4 left and right sides), a central phase shift structure located substantially centrally between the first and second end surfaces (col.9 lines 4-7), and first and second diffraction gratings respectively extending from the central phase shift structure to the first and second end faces (fig.4e), an average coupling coefficient k2 of a diffraction grating on one end face side (fig.4 right side) is smaller than an average coupling coefficient k1 of a diffraction grating on the other end face side (fig.4 left side) (col.12 lines 4-10). Abe does not teach the grating periods to be different, or the coupling coefficients to be greater than 100cm-1. Lo teaches a DFB semiconductor laser device (fig.1) in which the

coupling coefficients are greater than 100cm-1 (col.4 lines 11-21). Sato teaches a DFB laser in which the gratings on either side of the central phase shift region have different periods (fig.1). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe with the large coupling coefficients of Lo in order to increase resonator feedback, utilizing more gain, and allow for the reduction of the laser spot size (col.4 lines 22-25), as well as to combine the DFB laser with the asymmetrical diffraction gratings of Sato in order to flatten the electric field intensity distribution and increase the threshold gain difference (Sato, col.5 lines 15-20).

With respect to claim 8, Abe and Lo teach the DFB device outlined in the rejection to claim 1 and further teach changing the coupling coefficients, k1 and k2, via changing a thickness of a low refractive index layer between that of the active region and the high index grating portion (fig.7, col.11 lines 49-57).

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Sato and Lu et al. ("High Power and High Speed Performance of 1.3um Strained MQW Gain Coupled DFB Lasers," IEEE JQE, Vol.1, No.2 1995, pgs.375-381).

With respect to claim 2, Abe, Sato, and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to use complex coupling, and have the real part of a coupling coefficient be at least 4 times an imaginary part of a coupling coefficient. Lu teaches a complex coupled DFB laser in which a real part of a coupling coefficient is at least 4 times an imaginary part of a coupling coefficient (Fig.2, col.3

lines 22-29, where the figure and text describe utilizing real and imaginary components of ratios less than 25%). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Sato and Lo with the complex coupling of Lu in order to have less sensitivity to external reflections (Lu, col.1 lines 14-20) and to provide for enhanced single mode operation (Lu, col.3 lines 24-29).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Sato and Huang (US 6574261).

With respect to claim 3, Abe, Sato and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to include a plurality of phase shift structures located at substantially symmetrical positions with respect to the central phase sift portion in the diffraction gratings. Huang teaches a DFB semiconductor laser utilizing multiple phase shift structures (fig.9), located at substantially symmetrical positions with respect to the central phase sift portion in the diffraction gratings. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Sato and Lo with the multiple phase shift structures of Huang in order to uniformly distribute carriers and reduce spatial hole burning (Huang, col.12 lines 47-50).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Sato and Takahashi et al. (US 5727015).

With respect to claim 6, Abe, Sato and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to have a higher ratio of higher index material to lower index material in the k1 region than in the k2 region. Takahashi teaches DFB semiconductor laser in which the duty of the gratings is examined based on coupling coefficient values (fig.3a, in which it can be understood that a high coupling region, k1, could have a larger duty than a low coupling region, k2, this duty being defined as the length of the higher index region to the lower index region, col.1 lines 63-67, fig.1- comparing higher index #106 to lower index #108 as analyzed in fig.3a). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Sato and Lo with the high to low duty values of Huang in order to appropriately couple the E-field to a desired grating region.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Sato and Takiguchi et al. (US 5459747).

With respect to claim 7, Abe, Sato and Lo teach the DFB device outlined in the rejection to claim 1, including first and second diffraction gratings having alternating regions of higher and lower refractive index materials, but do not teach the gratings to have layered structures or that the number of layers in the higher index portion in the larger coupling area is higher than the number of layers in the higher index portion in the lower coupling area. Takiguchi teaches a DFB laser containing a layered grating (fig.1b) wherein it is taught that changing both the refractive index and the thickness of the grating layers will change the coupling coefficient (col.18-19 lines 57-5). It would

have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Sato and Lo with the layered gratings of Takiguchi in order to properly vary the thickness and refractive index of the gratings (as it is well known in the art that one way to change the effective refractive index, and the thickness, is to add additional layers of semiconductor material) to change the coupling coefficient to appropriately couple the E-field to a desired grating region.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Sato and Weber (US 5379318).

With respect to claim 9, Abe, Sato and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to satisfy the relationship that the effective index through grating2 times the period of grating2 be almost equal to the effective index of grating1 times the period of grating1. Weber teaches a semiconductor laser in which an effective index through a grating2 times the period of a grating2 be almost equal to the effective index of a grating1 times the period of a grating1 (fig.1 #G1,G3; the effective index of G3 would be greater than that of G1 due to the larger amount of high index grating material, but the period of G1 would be greater than that of G3 in order to correctly fit the relationship shown in fig.2, this leads to the approximate balancing of NeffG1*PeriodG1 almost equal to NeffG3*PeriodG3). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Sato and Lo with the grating structure of Weber in order to allow for a larger degree of wavelength selectivity.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TVR

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PRIMARY EXAMINER